K-STATE Research and Extension

Sorghum Growth and Development

Vegetative

Reproductive

Stage 0

Emergence – The plant breaks through the soil surface — early growth usually is slow. The time between planting and emergence depends on soil temperature, residue cover and distribution, soil moisture, planting depth, and seed vigor. Time planting so emergence occurs in favorable conditions.

Stage 1

Three-leaf stage – Only leaves with a visible collar (leaf tissue at the junction of the leaf blade and sheath) are counted. The growing point is under the soil surface, so any damage to the leaf area will delay flowering. This stage occurs 10 to 20 days after emergence, depending on soil temperature and moisture.

Stage 2

Five-leaf stage – Five leaves are fully expanded (visible collar). The growing point is below the soil surface. The plant begins a rapid growth and nutrient accumulation phase. The root system rapidly expands. Minimize weed competition from planting through this stage of growth. This stage occurs 20 to 25 days after emergence.

Stage 3

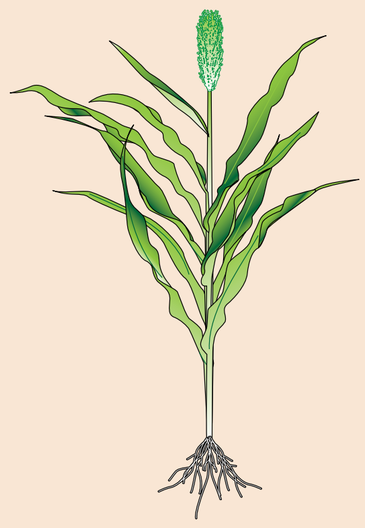
Growing point differentiation – Potential leaf number is defined 30 to 40 days after emergence. Maximum plant growth and nutrient uptake rates are achieved. The growing point is above the surface and changes from producing leaves to producing heads, which are the plant's reproductive structure (see drawing).

Stage 4

Flag leaf visible – Rapid stem elongation and increases in leaf area occur at this stage. The final leaf , the "flag leaf," is visible in the whorl. Potassium uptake is >40%, nitrogen >30%, phosphorus > 20%, and total growth is about 20% complete compared to the final achieved at maturity.

Stage 5

Boot stage – Maximum leaf area has been achieved. Maximum potential head size and seed number has been set. The upper stalk, known as the "peduncle," begins to elongate. Final size of the peduncle varies with the genotype. This stage occurs 50 to 60 days after emergence.

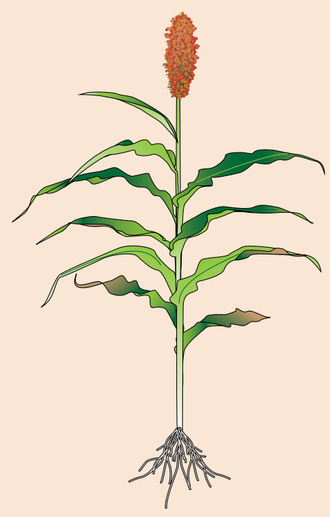


Stage 6

Half-bloom – Full exertion of the head occurs at this stage and 50% of the plants in the field are in some stage of bloom. For an individual plant, this stage is when the flowering reaches halfway down the head (the head flowers from tip downward). Total growth is 50% complete at this stage. Compared to final maturity, nutrient accumulation is 60% for phosphorus, 70% for nitrogen, and >80% for potassium.

Stage 7

Soft-dough – Grain formation begins immediately after flowering and the grain fills rapidly (50% of dry weight). The stem losses weight due to a remobilization process (from stem to grain). The head and its grains are the main priority for the plant; thus, without a good balance between leaves (source) and grain (sink), the duration of grain filling can be shortened.

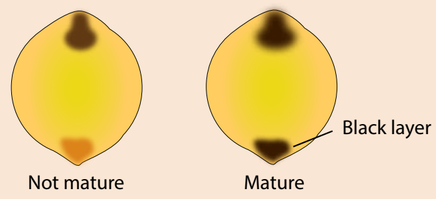


Stage 8

Hard-dough – Grain reaches 75% of its final dry weight and nutrient uptake is almost complete. Lower leaves lose functionality due to remobilization of nutrients to the grain. A severe stress at this growth stage severely reduces the final grain weight, producing light, chaffy grain.

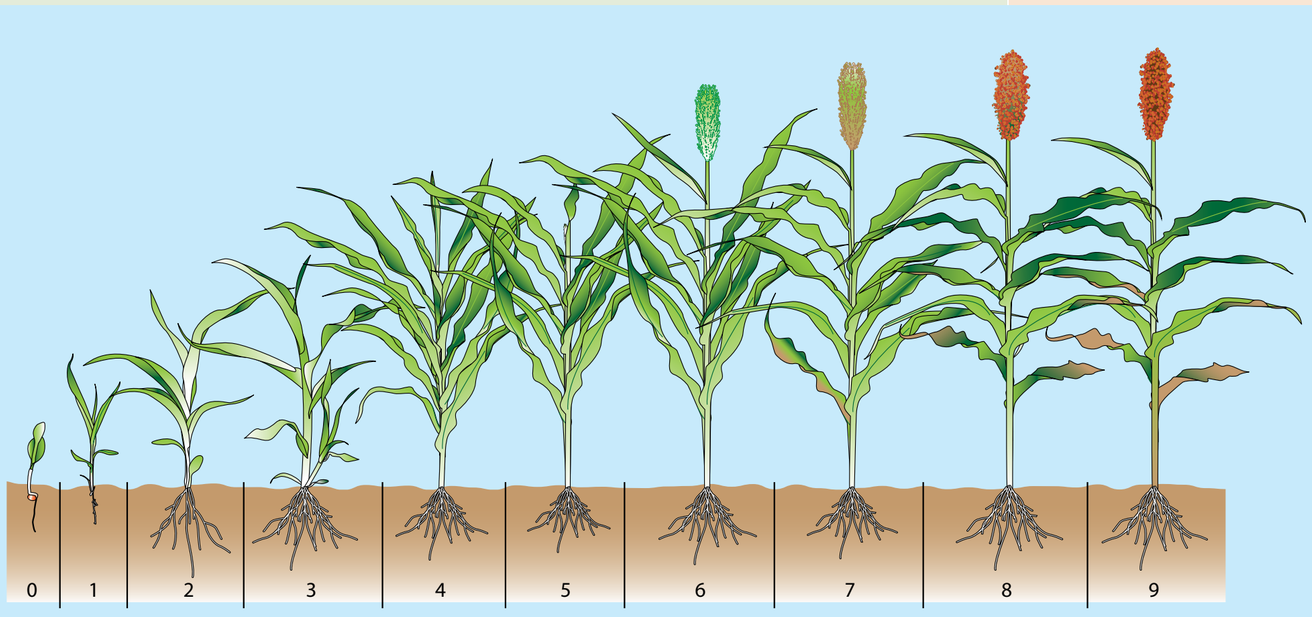
Stage 9

Physiological maturity – Grain achieves its maximum dry weight. This growth is identified by looking for the dark spot on the bottom of the kernel (see drawing). Grain moisture ranges from 25 to 35%. The time to harvest depends on the environmental conditions. Artificial drying can be promoted by the use of desiccants without affecting yield when applied after maturity. Sorghum plants with grain harvested may continue to use moisture until the plant freezes or is destroyed in some other way.



Sorghum Growth Stages and Identifying Characteristics

Growth stage	Identifying characteristic
0	**Emergence**. Coleoptile visible at soil surface.
1	**Three-leaf stage.** Collar of third leaf visible.
2	**Five-leaf stage.** Collar of fifth leaf visible.
3	**Growing point differentiation**. Approximately 8-leaf stage by previous criteria.
4	**Flag leaf visible.** Final leaf visible in whorl.
5	**Boot stage**. Head extended into flag leaf sheath.
6	**Half-bloom**. Half of the plants at some stage of bloom.
7	**Soft-dough.**
8	**Hard-dough.**
9	**Physiological maturity.** Maximum dry matter accumulation.



Sorghum Development Stages

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Based on information from *How a Sorghum Plant Develops*, S3, K-State Research and Extension

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